TRANSMISSION/RECEPTION INTEGRATED TYPE OPTICAL COMMUNICATION EQUIPMENT

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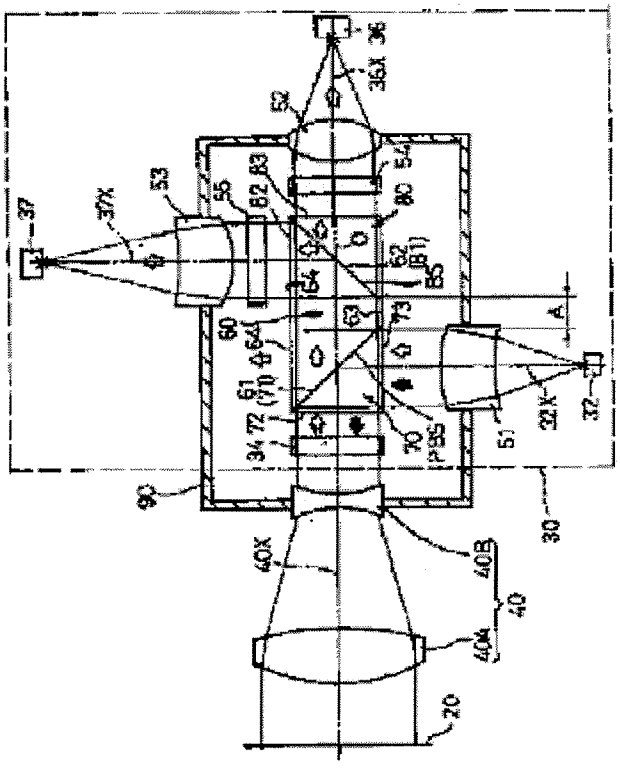
Abstract of **JP2000036793**

PROBLEM TO BE SOLVED: To provide transmission/reception integrated type optical communication equipment with reduced crosstalks for the transmission/reception integrated type optical communication equipment, having a transmission/reception part which has a transmission part provided with a laser light source, reception part and polarized light separating means for separating transmission light and reception light, optical telescopic system common for the transmission/reception, and a light flux deflecting means located between these components so as to be driven corresponding to the output of the position detecting element. SOLUTION: A transmission/reception part 30 is provided with a central prism 60 and a pair of auxiliary prisms 70 and 80 adhered to this central prism, and on these respective adhered faces, polarized light separating planes 61 and 62 for reflecting the transmission light towards the light flux deflecting means and transmitting the reception light and a light flux dividing plane for applying the reception light transmitted through the polarized light separating plane, while dividing it to a photodetector 36 and a position detecting element 37 are formed. Furthermore, the central prism 60 is provided with a plane part parallel with an incident direction for having these polarized light separating planes and light flux dividing plane in the incident



direction of the reception light separated.

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(54)【発明の名称】　送受信一体型光通信装置

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(57)【特許請求の範囲】

【請求項１】　送信情報に応じて変調されるレーザ光源を含む送信部と、変調レーザ光を受光する受光素子と位置検出素子を含む受信部と、上記送信部からの送信光と上記受信部への受信光を分離する偏光分離手段とを有する送受信部；送信光を投光し、受信光を受光する送受信系に共通の望遠光学系；及びこの望遠光学系と送受信部の間に位置し、上記位置検出素子の出力に応じて駆動される光束偏向手段；を有する送受信一体型光通信装置において、

上記送受信部は、中心プリズムとこの中心プリズムに接着される一対の補助プリズムとを有し、

この中心プリズムと一対の補助プリズムとの各接着面には、上記レーザ光源からの送信光を光束偏向手段に向けて反射させる一方、望遠鏡から入射する受信光を透過させる偏光分離面と、該偏光分離面を透過した受信光を上記受光素子と位置検出素子とに分割して与える光束分割面とが形成されており、

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かつ、上記中心プリズムに、その偏光分離面と光束分割面とを受信光の入射方向に離間させる、該入射方向と平行な方向の平面部が形成されていることを特徴とする送受信一体型光通信装置。

【請求項２】　請求項１記載の送受信一体型光通信装置において、上記中心プリズムと補助プリズムのケーシングに、レーザ光源から上記偏光分離面に入射して透過する漏れ光を外部に放出する穴が穿設されている送受信一体型光通信装置。

【請求項３】　請求項１または２記載の送受信一体型光通信装置において、偏光分離面と光束分割面の境界部に伸び、光束がレーザ光源側から光束分割面側に至るのを

防ぐ光路分割壁が設けられている送受信一体型光通信装置。

【請求項４】　請求項１ないし３のいずれか１項記載の送受信一体型光通信装置において、中心プリズムは、延長面が互いに直交する、上記偏光分離面と光束分割面、及びこの偏光分離面と光束分割面に対してそれぞれ４５°をなす上記平面部とを有し、一対の補助プリズムは、この中心プリズムの偏光分離面と光束分割面とにそれぞれ接着される接着面と、この接着面に対してそれぞれ４５°をなし互いに直交する入出射面とを有する直角プリズムからなっている送受信一体型光通信装置。

【発明の詳細な説明】

【０００１】

【技術分野】本発明は、光通信装置に関し、特に送受信を同一の光学系で行う送受信一体型光通信装置に関する。

【０００２】

【従来技術及びその問題点】図４は、本発明の対象とする送受信一体型の光通信装置の一例を示している。この光通信装置は、望遠鏡光学系１０、光束偏向手段２０、及び送受信部３０を備えている。望遠鏡光学系１０は、送信光の投光と、受信光の受信に共通に使用されるもので、図示例では反射望遠鏡からなっている。光束偏向手段２０は、望遠鏡光学系１０と送受信部３０との間に位置し、望遠鏡光学系１０から送受信部３０に至る受信光と、送受信部３０から望遠鏡光学系１０に至る送信光の方向を調節する。

【０００３】送受信部３０は、変調器３１により送信情報に応じて変調される、Ｓ偏光反射条件で設置された半導体レーザ光源３２と、この半導体レーザ光源３２からの直線偏光光束が入射するＳ偏光反射Ｐ偏光透過の偏光ビームスプリッタ３３とを有し、偏光ビームスプリッタ３３で反射したＳ偏光の直線偏光は、λ／４板３４を介して光束偏向手段２０に入射する。送受信部３０には、別の光送信機（対向機）からの信号光を受光するために、偏光ビームスプリッタ３３の透過光路上に、ビームスプリッタ３５が設けられ、このビームスプリッタ３５での分割光路上に、信号用の受光素子３６と、位置検出素子３７とがそれぞれ設けられている。すなわち、対向機からの受信光は、λ／４板３４を透過してＰ偏光の直線偏光となり、偏光ビームスプリッタ３３を透過してビームスプリッタ３５に至り、受光素子３６と位置検出素子３７の双方に入射する。受光素子３６で受信された受信光は、信号処理回路３８によって情報として取り出される。

【０００４】以上の送受信一体型光通信装置は、通常、同一構成の装置を半導体レーザ光源３２からのレーザ光束の到達範囲に対向させて設置し、お互いに変調器３１による変調信号を受光素子３６で受光して利用する。

【０００５】光束偏向手段２０は、一対の光通信装置からの送受信光の平行性を維持するものであり、例えば、直交二方向に駆動される偏向ミラーから構成される。この偏向ミラーの回動部には、コイルと磁石からなる電磁駆動装置が備えられ、この電磁駆動装置が、位置検出素子３７の出力によって駆動される。すなわち、位置検出素子３７は、送受信部３０に入力する受信光の受信位置（変化）を検出し、その出力を制御回路２１及びＸＹ駆動系２２を介してフィードバックして偏向ミラー２０をＸＹの二次元方向に駆動し、受信光を常時送受信部３０の正しい位置に入射させ、送信機の射出光と受信機の受信光との平行性を維持する。

【０００６】この送受信一体型光通信装置は、図４の概念的構成では、半導体レーザ光源３２からの送信光と、信号用の受光素子３６と位置検出素子３７への受信光とのクロストークが生じるおそれはない。しかし、実際の装置構成では、偏光ビームスプリッタ３３による偏光分離が１００％完全ではないこと（完全な偏光分離膜の構成は事実上不可能で、数％の漏れ光（迷光）が避けられないこと）、偏光ビームスプリッタ３３とビームスプリッタ３５とを近接して設置する可能性が高いこと、等の理由により、送信光が受信側の受光素子や位置検出素子に入射するクロストークが生じる可能性がある。

【０００７】

【発明の目的】本発明は従って、偏光ビームスプリッタとビームスプリッタ、つまり偏光分離面と光束分割面とを隣接して設置する場合において、送信光と受信光のクロストーク、特に送信光が受信側に到達するクロストークの問題を解決できる送受信一体型光通信装置を得ることを目的とする。

【０００８】

【発明の概要】本発明は、送信情報に応じて変調されるレーザ光源を含む送信部と、変調レーザ光を受光する受光素子と位置検出素子を含む受信部と、送信部からの送信光と受信部への受信光を分離する偏光分離手段とを有する送受信部；送信光を投光し、受信光を受光する送受信系に共通の望遠光学系；及びこの望遠光学系と送受信部の間に位置し、位置検出素子の出力に応じて駆動される光束偏向手段；を有する送受信一体型光通信装置において、送受信部に、中心プリズムとこの中心プリズムに接着される一対の補助プリズムとを設けて、この中心プリズムと一対の補助プリズムとの各接着面に、レーザ光源からの送信光を光束偏向手段に向けて反射させる一方、望遠鏡から入射する受信光を透過させる偏光分離面と、該偏光分離面を透過した受信光を受光素子と位置検出素子とに分割して与える光束分割面とを形成し、かつ、中心プリズムに、その偏光分離面と光束分割面とを受信光の入射方向に離間させる、該入射方向と平行な方向の平面部を形成したことを特徴としている。

【０００９】中心プリズムと補助プリズムのケーシングには、レーザ光源から偏光分離面に入射して透過する漏

れ光を外部に放出する穴を穿設することが望ましい。あるいは（さらに）、偏光分離面と光束分割面の境界部に伸び、光束がレーザ光源側から光束分割面側に至るのを防ぐ分割壁を設けることが望ましい。

【００１０】中心プリズムは、具体的には、延長面が互いに直交する、上記偏光分離面と光束分割面、及びこの偏光分離面と光束分割面に対してそれぞれ４５°をなす上記平面部とを有する変形直角プリズムとし、一対の補助プリズムは、この中心プリズムの偏光分離面と光束分割面とにそれぞれ接着される接着面と、この接着面に対してそれぞれ４５°をなし互いに直角をなす入出射面とを有する直角プリズムから構成することができる。

【００１１】

【発明の実施の形態】図１は、本発明による送受信一体型光通信装置の送受信部の第一の実施形態を示すもので、図４の従来装置と同一の構成要素には同一の符号を付している。本実施形態では、偏向ミラー２０と、送受信部３０との間に、第二アフォーカル光学系４０が配置されている。この第二アフォーカル光学系４０は、偏向ミラー２０側から送受信部３０側に順に、正レンズ群４０Ａと負レンズ群４０Ｂを有する。アフォーカル光学系は、一組の物点と像点が無限遠にあり、入射光が略平行であるとき出射光も略平行となるような光学系であり、物体側から３０側に光束径を縮径する。この縮径比（倍率）は、望遠鏡光学系（第一アフォーカル光学系）１０のそれを１：４（４倍）程度、第二アフォーカル光学系４０のそれを１：２（２倍程度）とすることができる。

【００１２】送受信部３０は、変形直角プリズムからなる中心プリズム６０と、一対の直角プリズムからなる補助プリズム７０、８０を有している。中心プリズム６０は、延長面が互いに直角（９０°）をなし、第二アフォーカル光学系４０の光軸４０Ｘに対して４５°をなす接着面６１、６２と、この接着面６１、６２に対してそれぞれ４５°をなす、光軸Ｏと平行な平面部６３、６４とを有している。幅狭の平面部６３は、接着面６１、６２を第二アフォーカル光学系４０の光軸４０Ｘ方向に離間させる作用をしている。

【００１３】補助プリズム７０は、この中心プリズム６０の接着面６１と接着される接着面７１と、この接着面７１に対して４５°をなし互いに直交する入出射面７２、７３を有している。同様に、補助プリズム８０は、中心プリズム６０の接着面６２と接着される接着面８１と、この接着面８１に対して４５°をなし互いに直交する入出射面８２、８３を有している。

【００１４】中心プリズム６０の接着面６１と、補助プリズム７０の接着面７１との接着面には、偏光分離膜が介在していて偏光分離面ＰＢＳが構成されており、中心プリズム６０の６２と補助プリズム８０の接着面８１との接着面には、光束分割膜が介在していて光束分割面ＢＳが構成されている。偏光分離面ＰＢＳは、第二アフォーカル光学系４０の光軸４０Ｘと半導体レーザ光源３２の光軸３２Ｘに対してそれぞれ４５°をなし、光束分割面ＢＳは、第二アフォーカル光学系４０の光軸４０Ｘと位置検出素子３７系の光軸３７Ｘに対してそれぞれ４５°をなしている。受光素子３６系の光軸３６Ｘは、第二アフォーカル光学系４０の光軸４０Ｘと一致している。

【００１５】半導体レーザ光源３２の光軸３２Ｘ上には、半導体レーザ光源３２からの光束を平行光束とするコリメータレンズ５１が配設され、受光素子３６系の光軸３６Ｘ上には、受信平行光束を受光素子３６に結像させる集光レンズ５２とバンドパスフィルタ５４が配置され、位置検出素子３７の光軸３７Ｘ上には、受信平行光束を位置検出素子３７に結像させる集光レンズ５３とバンドパスフィルタ５５が配置されている。補助プリズム７０の入出射面７２、７３、及び補助プリズム８０の入出射面８２、８３はそれぞれの面を通る各光軸と直交している。受光素子３６と位置検出素子３７の位置は、交換することができる。なお中心プリズム６０、補助プリズム７０、８０の接着体は、ケーシング９０中に支持されている。その具体的な支持部材の図示は省略している。

【００１６】半導体レーザ光源３２と偏光分離面ＰＢＳは、Ｓ偏光反射条件で設置されており、半導体レーザ光源３２から出射され、コリメータレンズ５１で平行光束とされた後、偏光分離面ＰＢＳで反射するＳ偏光光束は、第二アフォーカル光学系４０、偏向ミラー２０、及び望遠鏡光学系１０を介して相手側の光通信装置に投光される。また、受信光に着目すると、望遠光学系１０、光束偏向手段２０、第二アフォーカル光学系４０を介して送受信部３０の補助プリズム７０、中心プリズム６０、補助プリズム８０を透過する受信光束は平行光束であり、偏光分離面ＰＢＳの角度依存性の問題を回避できる。なお、λ／４板３４は、対向機間の偏光面を９０°回転させるためのものである。

【００１７】上記構成の本送受信一体型光通信装置は、従来装置と同様に、同一構成の装置を半導体レーザ光源３２からのレーザ光束の到達範囲に対向させて設置し、お互いに変調器３１による変調信号を受光素子３６で受光して利用する。このとき、半導体レーザ光源３２からのレーザ光束は、原理的には１００％が偏光分離面ＰＢＳで反射しＳ偏光光束だけが第二アフォーカル光学系４０、偏向ミラー２０、望遠鏡光学系１０を介して投光されるが、実際には数％の洩れ光が偏光分離面ＰＢＳを通過する。この通過光は、隣接している位置検出素子３７または受光素子３６に至りクロストークの問題を生じさせる可能性がある。つまり、対抗機からのＰ偏光光束が、偏光分離面ＰＢＳを通過して光束分割面ＢＳで分割され、位置検出素子３７と受光素子３６で受光される際、これらの受信光に送信光の洩れ光が混信し、受信信号又は（及び）位置検出信号が悪影響を受ける可能性が

ある。

【００１８】本実施形態では、中心プリズム６０に形成されている平面部６３によって、接着面６１と６２（偏光分離面ＰＢＳと光束分割面ＢＳ）の距離が離間させられており、このため、このクロストークの問題を回避することができる。

【００１９】図２は、本発明による送受信一体型光通信装置の別の実施形態を示す。この実施形態は、偏光分離面ＰＢＳを透過した光束をケーシング９０の外に積極的に出すために、ケーシング９０に、偏光分離面ＰＢＳの透過光路上に位置させて洩れ光束放出穴９１を穿設した実施形態である。

【００２０】図３は、本発明による送受信一体型光通信装置の別の実施形態を示す。この実施形態は、偏光分離面ＰＢＳと光束分割面ＢＳとの間に、光路分割壁９２を設けて偏光分離面ＰＢＳを透過した光束が位置検出素子３７（受光素子３６）側に至るのを防止した実施形態である。図２、図３におけるこの他の構成は、実質的に図１の実施形態と同一であり、同一要素には同一の符号を付して説明を省略する。図２の実施形態と図３の実施形態は、併用することができる。

【００２１】

【発明の効果】本発明によれば、送受信一体型光通信装置において、クロストークの問題を回避することができる。

【図面の簡単な説明】

＊【図１】本発明の送受信一体型光通信装置の送受信部の第一の実施形態を示す断面図である。

【図２】本発明の送受信一体型光通信装置の送受信部の第二の実施形態を示す断面図である。

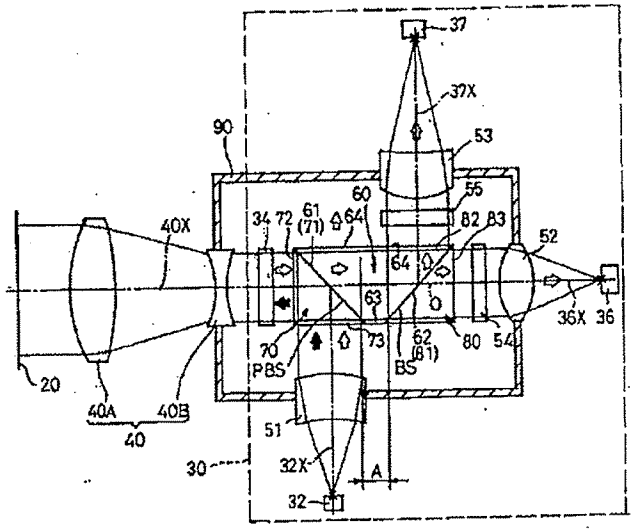
【図３】本発明の送受信一体型光通信装置の送受信部の第二の実施形態を示す断面図である。

【図４】従来の送受信一体型光通信装置の一例を示す系統図である。

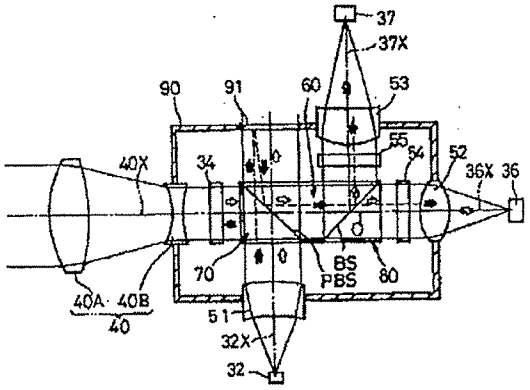
【符号の説明】

１０　望遠光学系（第一アフォーカル光学系）
２０　光束偏向手段
３０　送受信部
３１　変調器
３２　半導体レーザ光源
３６　受光素子
３７　位置検出素子
３８　信号処理回路
４０　第二アフォーカル光学系
６０　中心プリズム
６１　６２　接着面
６３　平面部
７０　８０　補助プリズム
７１　７２　８１　８２　接着面
９０　ケーシング
９１　洩れ光束放出穴
＊　９２　光路分割壁

【図１】



【図２】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40B
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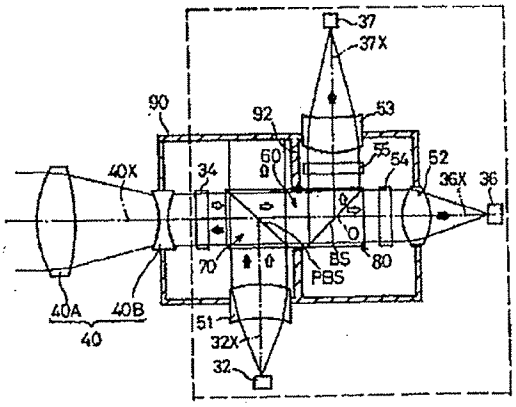
51
32X
32

【図３】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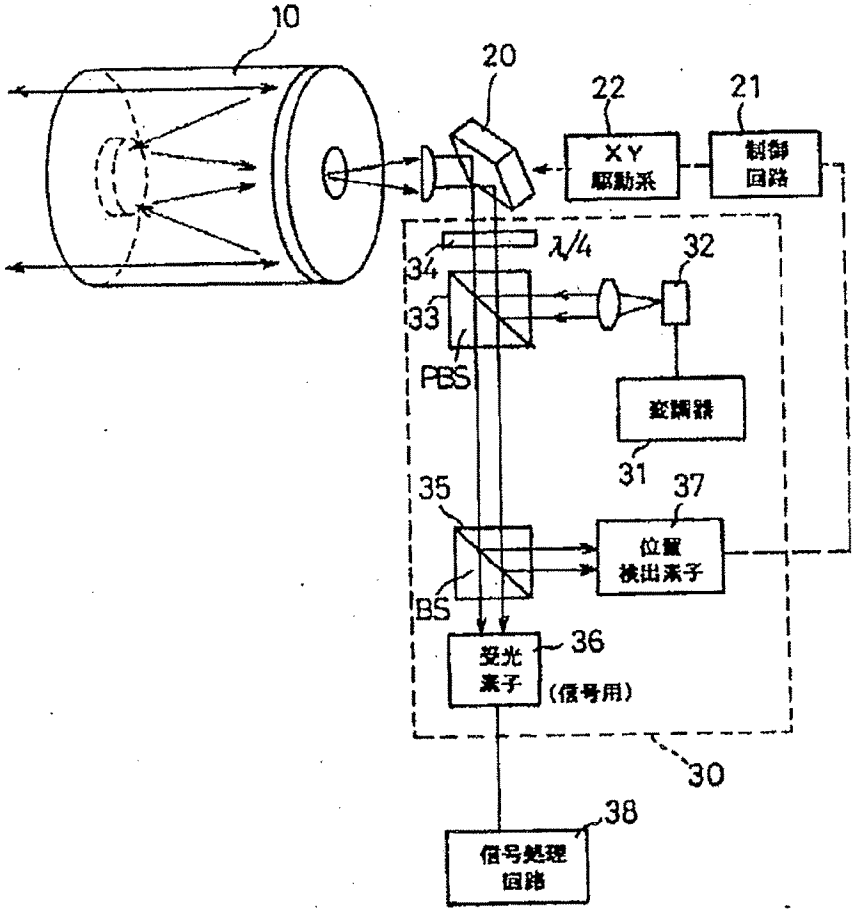
40B
40
51
32X
32

【図４】


10
20
22
XY
駆動系
21
制御
回路
λ/4
34
32
33
PBS
変調器
31
35
37
位置
検出素子
BS
受光
素子
36
(信号用)
30
38
信号処理
回路

フロントページの続き

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(56)参考文献　特開　平６－37722（ＪＰ，Ａ）
特開　平７－312578（ＪＰ，Ａ）
特開　平１－315721（ＪＰ，Ａ）
特開　平６－232455（ＪＰ，Ａ）
特開　平８－234061（ＪＰ，Ａ）

(58)調査した分野(Int.Cl.[7]，ＤＢ名)
H04B　10/00 - 10/28
H04J　14/00 - 14/08
G02B　13/00

FULL CONTENTS

(57) [Claim(s)]

[Claim 1] With the transmitting section containing the laser light source modulated according to transmit information, and the photo detector which receives modulated laser light and the receive section containing a location sensing element The transceiver section which has the transmission light from the above-mentioned transmitting section, and a polarized-light-separation means to separate the reception beam to the above-mentioned receive section; Transmission light is floodlighted. In the transmission-and-reception Shin-ichi form optical-communication equipment which has flux of light deflection means; which is located between looking-far optical-system; common to the receive and transmit system which receives a reception beam and this looking-far optical system, and the receive and transmit section, and is driven according to the output of the above-mentioned location sensing element The above-mentioned receive and transmit section has main prism and the auxiliary prism of a couple adhered to this main prism, and [each adhesion side of this main prism and the auxiliary prism of a couple] The polarized light separation plane which makes the reception beam which enters from a telescope penetrate while turning and reflecting the transmission light from the above-mentioned laser light source in a flux of light deflection means, The flux of light parting plane which divides and gives the reception beam which penetrated this polarized light separation plane to the above-mentioned photo detector and a location sensing element is formed. And transceiver integral-type optical-communication equipment characterized by forming the flat-surface section of a direction parallel to this incident direction which makes the incident direction of a reception beam estrange the polarized light separation plane and flux of light parting plane through the above-mentioned main prism.

[Claim 2] Transceiver integral-type optical-communication equipment with which the hole which emits outside the light leaking which enters into the above-mentioned polarized light separation plane, and is penetrated from a laser light source to casing of the above-mentioned main prism and an auxiliary prism in transmission-and-reception Shin-ichi form optical-communication equipment according to claim 1 is drilled.

[Claim 3] Transceiver integral-type optical-communication equipment with which the optical-path separating wall which prevents elongation and the flux of light resulting in the boundary section of a polarized light separation plane and a flux of light parting plane from the laser light source side at the flux of light parting plane side in transmission-and-reception Shin-ichi form optical-communication equipment according to claim 1 or 2 is established.

[Claim 4] In Claim 1 or the transmission-and-reception Shin-ichi form optical-communication equipment of three given in any 1 term, [main prism] An extension face has the above-mentioned flat-surface section which makes 45 degrees to the above-mentioned polarized light separation plane which intersects perpendicularly mutually, a flux of light parting plane, and this polarized light separation plane and a flux of light parting plane, respectively, and it [the auxiliary prism of a couple] Transceiver integral-type optical-communication equipment which consists of a rectangular prism which has the adhesion side pasted up on the polarized

light separation plane and flux of light parting plane of this main prism, respectively, and the close emission face which intersects 45 degrees perpendicularly mutually nothing to this adhesion side, respectively.

[Detailed Description of the Invention]
[0001]
[Field of the Invention] Especially this invention relates to the transceiver integral-type optical-communication equipment which performs receive and transmit by the same optical system about optical-communication equipment.
[0002]
[Description of the Prior Art] Drawing 4 shows an example of the optical-communication equipment of the transmission-and-reception Shin-ichi form made into the object of this invention. This optical-communication equipment is equipped with the telescopic optical system 10, the flux of light deflection means 20, and the receive and transmit section 30. The telescopic optical system 10 is used common to floodlighting of transmission light, and reception of a reception beam, and consists of a reflecting telescope in the example of a graphic display. The flux of light deflection means 20 is located between the telescopic optical system 10 and the receive and transmit section 30, and adjusts the direction of the reception beam from the telescopic optical system 10 to the receive and transmit section 30, and the transmission light from the receive and transmit section 30 to the telescopic optical system 10.
[0003] The semiconductor laser light source 32 installed on S polarization reflective conditions that the receive and transmit section 30 is modulated according to transmit information by a modulator 31, Having the polarization beam splitter 33 of the S polarization reflective P polarization transparency into which the linearly polarized light flux of light from this semiconductor laser light source 32 enters, the linearly polarized light of S polarization reflected by the polarization beam splitter 33 enters into the flux of light deflection means 20 through lambda/4 plate 34. In order to receive the optical signal from another optical transmitter (opposite machine) in the receive and transmit section 30 A beam splitter 35 is formed in the transmitted light on the street of the polarization beam splitter 33, and the photo detector 36 and the location sensing element 37 for signals are prepared in it the split light on the street in this beam splitter 35, respectively. That is, the reception beam from an opposite machine penetrates lambda/4 plate 34, turns into the linearly polarized light of P polarization, penetrates the polarization beam splitter 33, results in a beam splitter 35, and enters into the both sides of the photo detector 36 and the location sensing element 37. The reception beam received with the photo detector 36 is taken out by the digital disposal circuit 38 as information.
[0004] Usually the equipment of the same composition is made to counter the range of access of the laser luminous flux from the semiconductor laser light source 32, and the transmission-and-reception Shin-ichi form optical-communication equipment of a more than installs it, and receives and uses the modulating signal by a modulator 31 with the photo detector 36 mutually.
[0005] The flux of light deflection means 20 maintains the parallelism of transmission-and-reception Nobumitsu from the optical-communication equipment of a couple, and consists of deflection mirrors driven for rectangular two way types. The rotation section of this deflection mirror is equipped with the electromagnetism driving gear which consists of a coil and a magnet, and this electromagnetism driving gear drives with the output of the location sensing element 37. Namely, the location sensing element 37 detects the reception position (change) of the reception beam inputted into the receive and transmit section 30. The output is fed back

through the control circuit 21 and the XY drive system 22, the deflection mirror 20 is driven in the direction of two dimensions of XY, a reception beam is always entered in the right location of the receive and transmit section 30, and the parallelism of the injection light of a transmitter and the reception beam of a receiver is maintained.

[0006] There is no possibility that the cross talk of the transmission light from the semiconductor laser light source 32 and the reception beam to the photo detector 36 and the location sensing element 37 for signals may produce this transmission-and-reception Shin-ichi form optical-communication equipment with the notional composition of drawing 4 . However, the polarized light separation according to the polarization beam splitter 33 by a actual equipment configuration is not perfect 100% ([composition / the composition of the perfect polarized-light-separation film is impossible as a matter of fact, and]). The light leaking (stray light) of several percent is avoided, and the cross talk with which transmission light enters into the photo detector and location sensing element of a receiving side may arise for the Reasons nil why possibility of approaching and installing what nothing is, the polarization beam splitter 33, and a beam splitter 35 is high etc.

[0007]

[Objects of the Invention] [when this invention follows, and installing a polarization beam splitter, a beam splitter, i.e., a polarized light separation plane, and a flux of light parting plane adjacently] It aims at obtaining the transceiver integral-type optical-communication equipment which can solve the problem of the cross talk of transmission light and a reception beam, especially the cross talk with which transmission light reaches a receiving side.

[0008]

[Summary of the Invention] The transmitting section in which this invention contains the laser light source modulated according to transmit information, The transceiver section which has the photo detector which receives modulated laser light, the receive section containing a location sensing element, and the transmission light from the transmitting section and a polarized-light-separation means to separate the reception beam to a receive section; Transmission light is floodlighted. In the transmission-and-reception Shin-ichi form optical-communication equipment which has flux of light deflection means; which is located between looking-far optical-system; common to the receive and transmit system which receives a reception beam and this looking-far optical system, and the receive and transmit section, and is driven according to the output of a location sensing element Main prism and the auxiliary prism of a couple adhered to this main prism are formed in the receive and transmit section. The polarized light separation plane which makes the reception beam which enters from a telescope penetrate while making a flux of light deflection means turn and reflect the transmission light from a laser light source in each adhesion side of this main prism and the auxiliary prism of a couple, It is characterized by forming the flat-surface section of a direction parallel to this incident direction which forms the flux of light parting plane which divides and gives the reception beam which penetrated this polarized light separation plane to a photo detector and a location sensing element, and makes main prism estrange the polarized light separation plane and flux of light parting plane to the incident direction of a reception beam.

[0009] It is desirable to drill the hole which emits outside the light leaking which enters into a polarized light separation plane and is penetrated from a laser light source in casing of main prism and an auxiliary prism. Or (further) it is desirable to prepare the separating wall which prevents elongation and the flux of light resulting [from the laser light source side] in the flux of light parting plane side in the boundary section of a polarized light separation plane and a flux of light parting plane.

[0010] The above-mentioned polarized light separation plane and flux of light parting plane, as for main prism, parting plane and an extension face specifically cross at right angles mutually, And use the above-mentioned flat-surface section which makes 45 degrees to this

polarized light separation plane and a flux of light parting plane, respectively as the deformation rectangular prism which it has, and [the auxiliary prism of a couple] It can constitute from a rectangular prism which has the adhesion side pasted up on the polarized light separation plane and flux of light parting plane of this main prism, respectively, and the close emission face which makes the right angle of each other [nothing in 45 degrees] to this adhesion side, respectively.

[0011]

[Embodiment of the Invention] Drawing 1 shows the first embodiment of the receive and transmit section of the transmission-and-reception Shin-ichi form optical-communication equipment by this invention, and gives the same sign to the same component as the conventional equipment of drawing 4 . this embodiment -- between the deflection mirror 20 and the receive and transmit sections 30 -- the -- the 2 afocal optical system 40 is arranged. the [this] -- the 2 afocal optical system 40 has the positive lens group 40A and the negative lens group 40B in order in the receive and transmit section 30 side from the deflection mirror 20 side. Afocal optical system has the object point and the image point of a lot in infinite distance, when incident light is abbreviation parallel, it is the optical system from which emitted light also serves as abbreviation parallel, and it reduces the diameter of a luminous flux diameter from the body side to 30 sides. this diameter reduction ratio (scale factor) -- it of the telescopic optical system (first afocal optical system) 10 -- the [1:4 (4 times) grade and] -- it of the 2 afocal optical system 40 can be set to 1:2 (about 2 times).

[0012] The receive and transmit section 30 has the auxiliary prism 70 which consists of main prism 60 which consists of a deformation rectangular prism, and a rectangular prism of a couple, and 80. the main prism 60 -- an extension face -- mutual -- a right angle (90 degrees) -- the [nothing and] -- it has the flat-surface section 63 parallel to an optical axis O which makes 45 degrees to the adhesion side 61 which makes 45 degrees to the optical axis 40X of the 2 afocal optical system 40, 62, and this adhesion side 61 and 62, respectively, and 64. the narrow flat-surface section 63 -- the adhesion side 61 and 62 -- the -- the operation which makes it estrange in the direction of optical-axis 40X of the 2 afocal optical system 40 is carried out..

[0013] The auxiliary prism 70 has the adhesion side 61 of this main prism 60, the adhesion side 71 to paste up, the close emission face 72 which intersects 45 degrees perpendicularly mutually nothing to this adhesion side 71, and 73. Similarly the auxiliary prism 80 has the adhesion side 62 of the main prism 60, the adhesion side 81 to paste up, the close emission face 82 which intersects 45 degrees perpendicularly mutually nothing to this adhesion side 81, and 83.

[0014] [the adhesion side of the adhesion side 61 of the main prism 60, and the adhesion side 71 of the auxiliary prism 70] The polarized-light-separation film intervenes, and the polarized light separation plane PBS is constituted, it is placed between adhesion sides with the adhesion side 81 of the 62 and the auxiliary prism 80 of the main prism 60 by the flux of light division film, and the flux of light parting plane BS is constituted. the polarized light separation plane PBS -- the -- as opposed to the optical axis 40X of the 2 afocal optical system 40, and the optical axis 32X of the semiconductor laser light source 32 -- respectively -- 45 degrees -- nothing and the flux of light parting plane BS -- the -- 45 degrees is made to the optical axis 40X of the 2 afocal optical system 40, and the optical axis 37X of location sensing element 37 system, respectively. the optical axis 36X of photo detector 36 system -- the -- it is in agreement with the optical axis 40X of the 2 afocal optical system 40.

[0015] On the optical axis 32X of the semiconductor laser light source 32, the flux of light from the semiconductor laser light source 32 is arranged by the collimator lens 51 made into a parallel pencil, and it on the optical axis 36X of photo detector 36 system The condenser lens 52 and band pass filter 54 which carry out image formation of the receiving parallel pencil to the photo detector 36 are arranged, and the condenser lens 53 and band pass filter 55 which

carry out image formation of the receiving parallel pencil to the location sensing element 37 are arranged on the optical axis 37X of the location sensing element 37. The close emission face 72 of the auxiliary prism 70, 73 and the close emission face 82 of the auxiliary prism 80, and 83 lie at right angles to each optical axis passing through each field. The location of the photo detector 36 and the location sensing element 37 is exchangeable. In addition, the main prism 60, the auxiliary prism 70, and the adapter of 80 are supported in casing 90. The graphic display of the concrete supporter material is omitted.

[0016] [the semiconductor laser light source 32 and the polarized light separation plane PBS] [S polarization beam reflected by the polarized light separation plane PBS] after being installed on S polarization reflective conditions, acting as Idei from the semiconductor laser light source 32 and being considered as a parallel pencil with a collimator lens 51 the -- it is floodlighted by the optical-communication equipment of the other party through the 2 afocal optical system 40, the deflection mirror 20, and the telescopic optical system 10. moreover -- if its attention is paid to a reception beam -- the [the looking-far optical system 10, the flux of light deflection means 20, and] -- the reception beam bundle which penetrates the auxiliary prism 70 of the receive and transmit section 30, the main prism 60, and the auxiliary prism 80 through the 2 afocal optical system 40 is a parallel pencil, and can avoid the problem of the angular dependence of the polarized light separation plane PBS. In addition, lambda/4 plate 34 is for rotating 90 degrees of plane of polarization between opposite machines.

[0017] The equipment of the same composition is made to counter the range of access of the laser luminous flux from the semiconductor laser light source 32, and this transmission-and-reception Shin-ichi form optical-communication equipment of the above-mentioned composition installs it, and receives and uses the modulating signal by a modulator 31 with the photo detector 36 mutually. [as well as / conventionally / equipment] reflecting 100% of theoretically the laser luminous flux from the semiconductor laser light source 32 by the polarized light separation plane PBS at this time -- S polarization beam -- the -- although floodlighted through the 2 afocal optical system 40, the deflection mirror 20, and the telescopic optical system 10, the leak light of several percent passes the polarized light separation plane PBS actually. This passage light may result in the adjoining location sensing element 37 or the adjoining photo detector 36, and may produce the problem of a cross talk. That is, when P polarization beam from a confrontation machine passes the polarized light separation plane PBS, is divided by the flux of light parting plane BS and received with the location sensing element 37 and the photo detector 36, the leak light of transmission light interferes in these reception beams, and an input signal or (reaching) a position detection signal may receive an adverse effect.

[0018] In this embodiment, the adhesion side 61 and the distance of 62 (the polarized light separation plane PBS and the flux of light parting plane BS) can be made to be able to estrange by the flat-surface section 63 currently formed in the main prism 60, and, for this reason, the problem of this cross talk can be avoided by it.

[0019] Drawing 2 shows another embodiment of the transceiver integral-type optical-communication equipment by this invention. This embodiment is an embodiment which casing 90 was located in the transmitted light on the street of the polarized light separation plane PBS, leaked to it, and drilled the flux of light bleedoff hole 91 in it, in order to take out positively the flux of light which penetrated the polarized light separation plane PBS out of casing 90.

[0020] Drawing 3 shows another embodiment of the transceiver integral-type optical-communication equipment by this invention. This embodiment is an embodiment which prevented that the flux of light which established the optical-path separating wall 92 between the polarized light separation plane PBS and the flux of light parting plane BS, and penetrated the polarized light separation plane PBS resulted in the location sensing element 37 (photo detector 36) side. The other composition in drawing 2 and drawing 3 is substantially the same

as that of the embodiment of drawing 1 , gives the same sign to the same element, and omits explanation. The embodiment of drawing 2 and the embodiment of drawing 3 can be used together.

[0021]

[Effect of the Invention] According to this invention, in transmission-and-reception Shin-ichi form optical-communication equipment, the problem of a cross talk is avoidable.

[Brief Description of the Drawings]

[Drawing 1] It is the sectional view showing the first embodiment of the receive and transmit section of the transmission-and-reception Shin-ichi form optical-communication equipment of this invention.

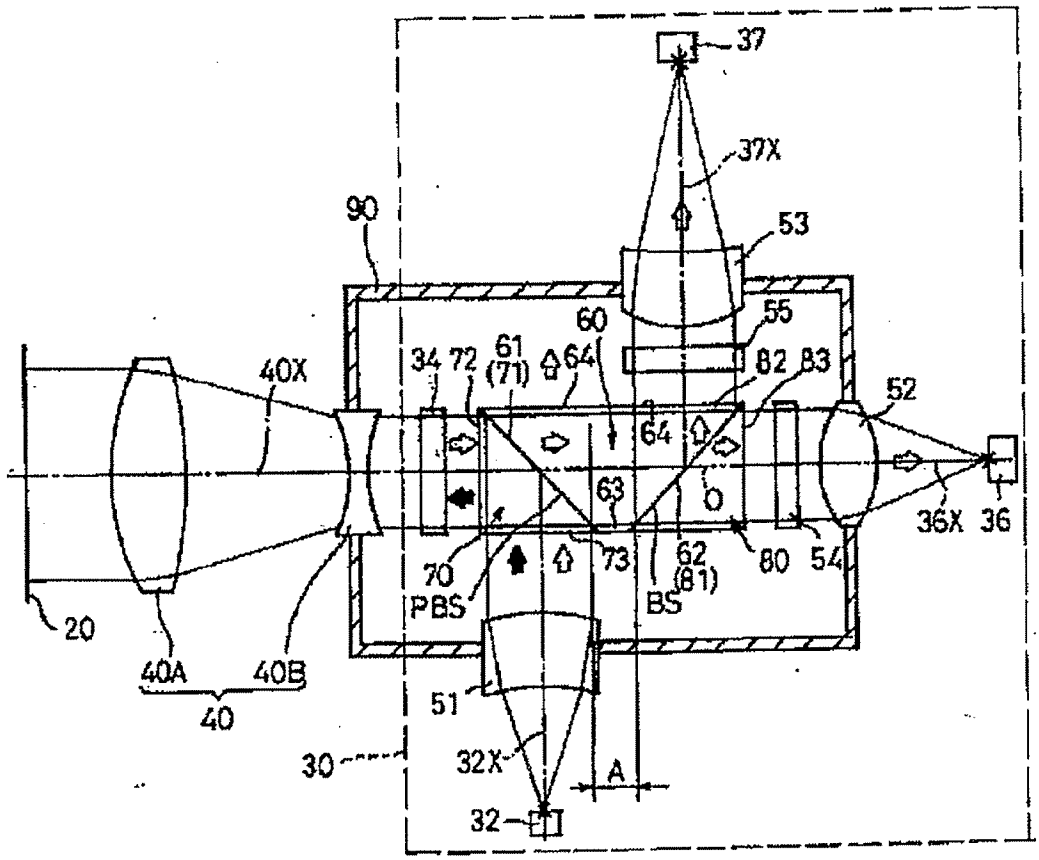
[Drawing 2] It is the sectional view showing the second embodiment of the receive and transmit section of the transmission-and-reception Shin-ichi form optical-communication equipment of this invention.

[Drawing 3] It is the sectional view showing the second embodiment of the receive and transmit section of the transmission-and-reception Shin-ichi form optical-communication equipment of this invention.

[Drawing 4] It is the schematic diagram showing an example of conventional transmission-and-reception Shin-ichi form optical-communication equipment.

[Description of Notations]

10 Looking-Far Optical System (First Afocal Optical System)
20 Flux of Light Deflection Means
30 Transceiver Section
31 Modulator
32 Semiconductor Laser Light Source
36 Photo Detector
37 Location Sensing Element
38 Digital Disposal Circuit
40 the -- 2 Afocal Optical System
60 Main Prism
61 62 Adhesion Side
63 Flat-Surface Section
70 80 Auxiliary Prism
71 72 81 82 Adhesion Side
90 Casing
91 Leak Flux of Light Bleedoff Hole
92 Optical-Path Separating Wall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72
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(71)
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40X
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63
O
36X
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70
PBS
73
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(81)
BS
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40A
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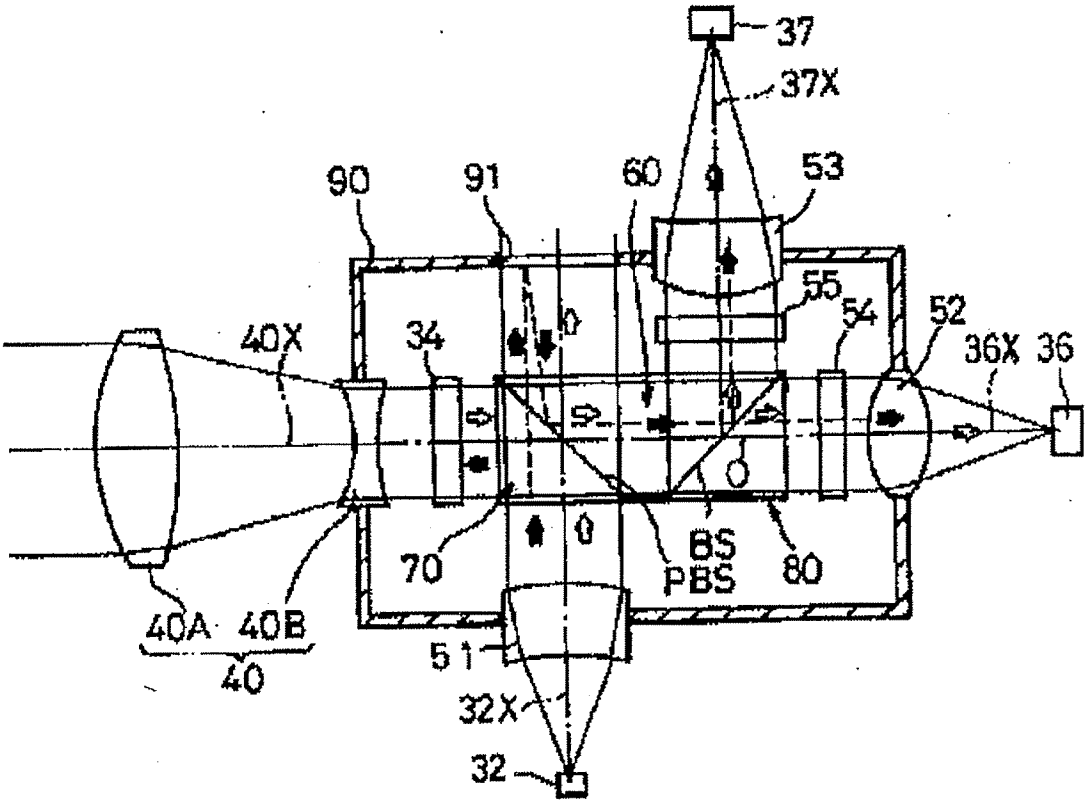
30
32X
A
32

Fig. 1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32X
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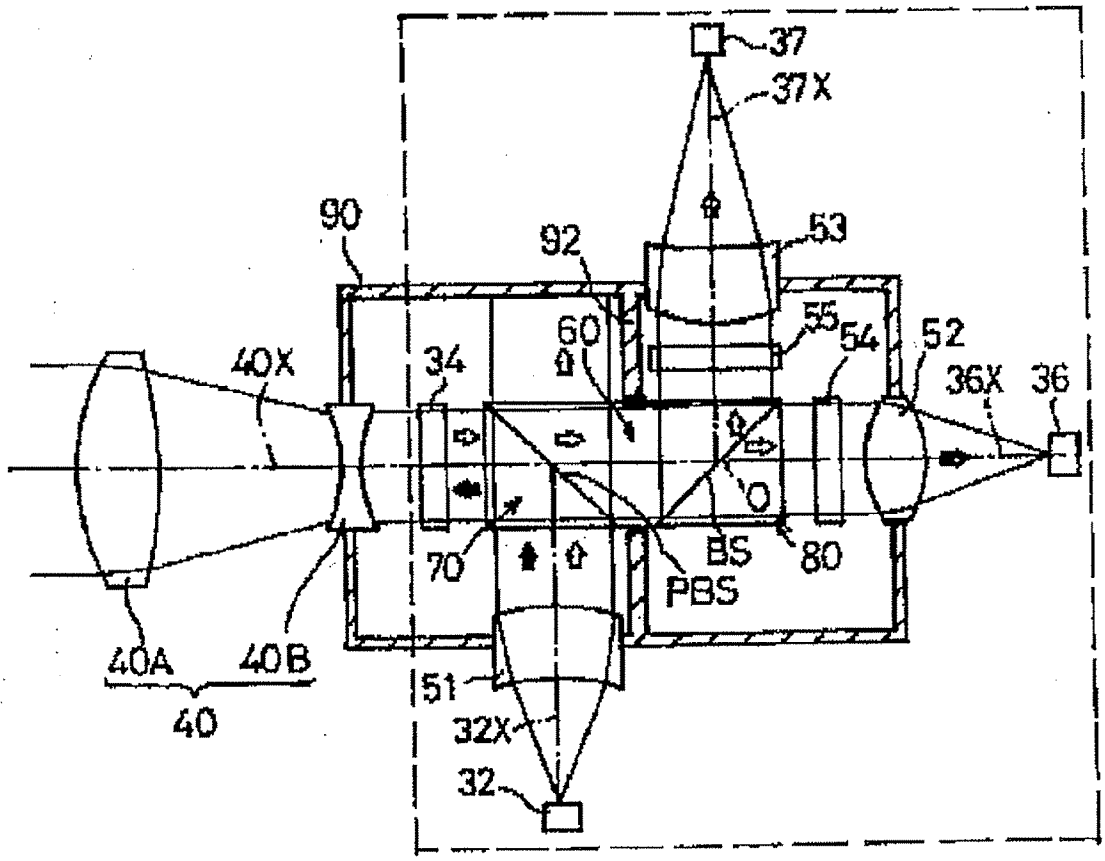
Fig. 2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51
32X
32

Fig. 3

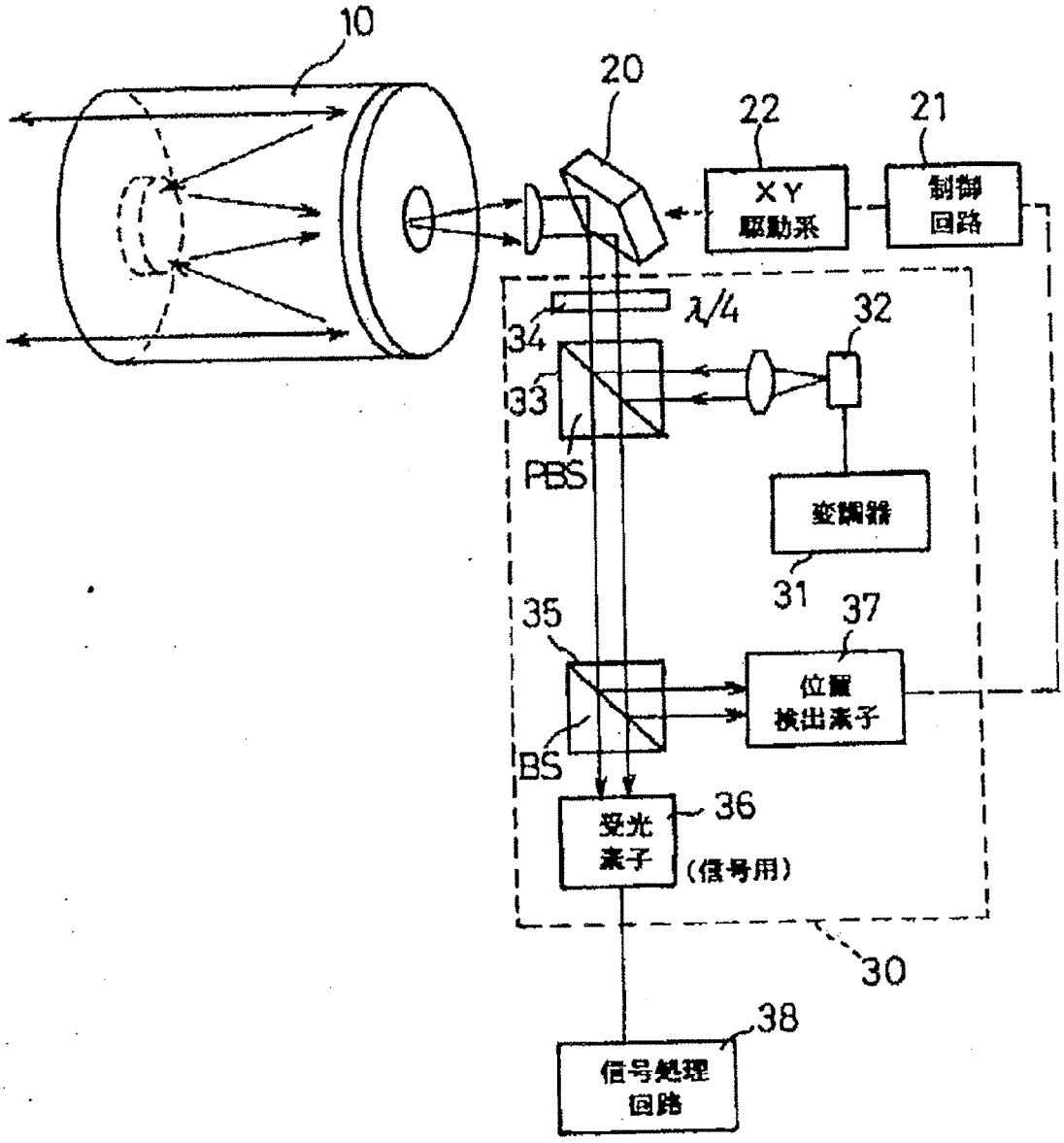

Fig. 4

[Translation done.]